MultiModem® iCell

MTCMR User Guide

MultiModem® iCell User Guide

Models: MTCMR-E1, -C1, -C2 -G2, -H5, -EV2, -EV3, optional -GP builds

Part Number: S000484, Version 9.3

Copyright

This publication may not be reproduced, in whole or in part, without the specific and express prior written permission signed by an executive officer of Multi-Tech Systems, Inc. All rights reserved. **Copyright © 2013 by Multi-Tech Systems, Inc.**

Multi-Tech Systems, Inc. makes no representations or warranties, whether express, implied or by estoppels, with respect to the content, information, material and recommendations herein and specifically disclaims any implied warranties of merchantability, fitness for any particular purpose and non-infringement.

Multi-Tech Systems, Inc. reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of Multi-Tech Systems, Inc. to notify any person or organization of such revisions or changes.

Legal Notices

The Multi-Tech products are not designed, manufactured or intended for use, and should not be used, or sold or re-sold for use, in connection with applications requiring fail-safe performance or in applications where the failure of the products would reasonably be expected to result in personal injury or death, significant property damage, or serious physical or environmental damage. Examples of such use include life support machines or other life preserving medical devices or systems, air traffic control or aircraft navigation or communications systems, control equipment for nuclear facilities, or missile, nuclear, biological or chemical weapons or other military applications ("Restricted Applications"). Use of the products in such Restricted Applications is at the user's sole risk and liability.

MULTI-TECH DOES NOT WARRANT THAT THE TRANSMISSION OF DATA BY A PRODUCT OVER A CELLULAR COMMUNICATIONS NETWORK WILL BE UNINTERRUPTED, TIMELY, SECURE OR ERROR FREE, NOR DOES MULTI-TECH WARRANT ANY CONNECTION OR ACCESSIBILITY TO ANY CELLULAR COMMUNICATIONS NETWORK. MULTI-TECH WILL HAVE NO LIABILITY FOR ANY LOSSES, DAMAGES, OBLIGATIONS, PENALTIES, DEFICIENCIES, LIABILITIES, COSTS OR EXPENSES (INCLUDING WITHOUT LIMITATION REASONABLE ATTORNEYS FEES) RELATED TO TEMPORARY INABILITY TO ACCESS A CELLULAR COMMUNICATIONS NETWORK USING THE PRODUCTS.

Trademarks

The Multi-Tech logo and MultiModem are a registered trademarks of Multi-Tech Systems, Inc. All other brand and product names are trademarks or registered trademarks of their respective companies.

Contacting Multi-Tech

Knowledge Base

The Knowledge Base provides immediate access to support information and resolutions for all Multi-Tech products. Visit http://www.multitech.com/kb.go.

Support Portal

To create an account and submit a support case directly to our technical support team, visit: https://support.multitech.com.

Support

Business Hours: M-F, 8am to 5pm CT

Country	By Email	By Phone
Europe, Middle East, Africa:	support@multitech.co.uk	+(44) 118 959 7774
U.S., Canada, all others:	support@multitech.com	(800) 972-2439 or (763) 717-5863

Warranty

To read the warranty statement for your product, visit www.multitech.com/warranty.go. For other warranty options, visit www.multitech.com/es.go.

World Headquarters

Multi-Tech Systems, Inc.

2205 Woodale Drive, Mounds View, MN 55112

Phone: (800) 328-9717 or (763) 785-3500

Fax (763) 785-9874

Contents

Product Overview **6**
Overview 6
Model Options 6
Related Documentation 6
Package Contents 7
Safety Notices and Warnings **8**
General Safety 8
Radio Frequency (RF) Safety 8
Sécurité relative au bâti 8
Interference with Pacemakers and Other Medical Devices 9
Potential interference 9
Precautions for pacemaker wearers 9
Vehicle Safety 9
User Responsibility 10
Device Maintenance 10
LEDs, Connectors, and Specifications **11**
Front 11
LEDs 11
Back 12
MTCMR-H5 Specifications 13
MTCMR-EV3 Specifications 14
MTCMR-EV2 Specifications 15
MTCMR-G2 Specifications 17
MTCMR-C1 Specifications 18
MTCMR-C2 Specifications 19
MTCMR-E1 Specifications 20
Power Measurements 23
MTCMR-H5 23
MTCMR-H5-GP 24
MTCMR-EV3 24
MTCMR-EV3-GP 25
MTCMR-EV2 26
MTCMR-EV2 27
MTCMR-G2 28
MTCMR-G2-GP 28
MTCMR-C1 28
MTCMR-C1-GP 29

MTCMR-C2 29
MTCMR-C2-GP 30
MTCMR-E1 30
MTCMR-E1-GP 30
RF Specifications 31
Antenna Information 31
PTCRB Requirements 31
Cellular Antenna Information 31
EV-DO and CDMA Antenna Information 32
GSM/EGSM Antenna Requirements/Specifications 33
FCC Requirements Note 33
Global Positioning System (GPS) 33
Connecting Direct DC Power accessories 34
GPIO 35
GPIO Cable 35
GPIO Connector 35
RS-232 9-Pin Female Connector 36
Device Activation and Installation 38
Account Activation for Cellular Devices 38
Device Phone Number 38
Notice for Devices that Use Aeris Radios 38
Installing and Removing SIM Cards 38
Installing a SIM Card 38
Removing a SIM Card 39
Attaching Power Supply Blades 39
Power Supply and Blades 39
Attaching the Blades 39
Connecting Antennas, Cables, and Power 40
Connecting Direct DC Power accessories 40
Mounting the Device on a Flat Surface 40
Installing Drivers 41
Verifying that Modem Installed Successfully in Windows 42
Basic Operations 43
Device Phone Number 43
Sending AT Commands 43
Verifying Signal Strength 43
Example 44
Checking Network Registration 44
Checking Network Registration for EV2 and C2 44
Connecting to the Internet 44
Creating a Windows Dial-Up Connection 45

Setting the Access Point Number (APN) in Modem's Properties 45
Creating a Dial-up Connection in Linux 45
Setting the Serial Baud Rate 45
Recovery 46
Regulatory Statements 47
EMC, Safety, and R&TTE Directive Compliance 47
International Modem Restrictions 47
47 CFR Part 15 Regulation Class B Devices 47
Industry Canada Class B Notice 47
Environmental Notices 49
Waste Electrical and Electronic Equipment Statement 49
WEEE Directive 49
Instructions for Disposal of WEEE by Users in the European Union 49
REACH Statement 50
Registration of Substances 50
Substances of Very High Concern (SVHC) 50
Restriction of the Use of Hazardous Substances (RoHS) 51
Information on HS/TS Substances According to Chinese Standards 52
Information on HS/TS Substances According to Chinese Standards (in Chinese) 53
Index 54

Product Overview

Overview

MultiModem iCell modems provide wireless data communications and integrate seamlessly with other applications. MultiModem iCell includes Universal IP® stack, which allows users to implement functions such as persistent connectivity and event monitoring.

Model Options

Model	Description
MTCMR-E1	Quad-band E-GPRS Class 12 performance
MTCMR-E1-GP	Quad-band E-GPRS Class 12 performance; GPS
MTCMR-C1	Multi-band CDMA2000 1xRTT performance
MTCMR-C1-GP	Multi-band CDMA2000 1xRTT performance; GPS
MTCMR-G2	Quad-band GSM/GPRS Class 10 performance
MTCMR-G2-GP	Quad-band GSM/GPRS Class 10 performance; GPS
MTCMR-H5	Standards based tri-band UMTS/HSPA performance
MTCMR-H5-GP	Standards based tri-band UMTS/HSPA performance; GPS
MTCMR-EV2	Dual-band 800/1900 MHz with receive diversity support on EVDO bands
MTCMR-EV2-GP	Dual-band 800/1900 MHz with receive diversity support on EVDO bands; GPS
MTCMR-EV3	Dual-band 800/1900 MHz with receive diversity support on EVDO bands
MTCMR-EV3-GP	Dual-band 800/1900 MHz with receive diversity support on EVDO bands; GPS
MTCMR-C2	CDMA Modem (RS-232/USB)
MTCMR-C2-GP	CDMA Modem (RS-232/USB); GPS

Related Documentation

Use AT Commands to configure your device. The following documentation is available on the Multi-Tech website at www.multitech.com/setup/product.go.

Model	Document
All	S000457 Universal IP AT Commands Reference Guide
MTCMR-H5	S000574 HSPA+ AT Commands Reference Guide
MTCMR-EV3	S000546 EV-DO and CDMA AT Commands Reference Guide
MTCMR-EV2	S000482 CDMA 1xEV-DO AT Commands Reference Guide
MTCMR-G2	S000463 GPRS G2 Modems AT Commands Reference Guide
MTCMR-E1	S000474 Wireless EDGE (E1) Modems AT Commands Reference Guide
MTCMR-C1	S000478 CDMA-C1 AT Commands Reference Guide
MTCMR-C2	S000546 EV-DO and CDMA AT Commands Reference Guide

Package Contents

Note: For HSPA+, EDGE, and GPRS devices, your wireless provider supplies the SIM card. Other models do not use SIM cards.

Unbundled Package with No Accessories	Bundled Package with Accessories
1 modem **Note:** Package does not include mounting screws, AC or DC power supply, and antenna(s).	1 modem 1 antenna (-GP builds have an additional GPS antenna) 1 RS-232 cable 1 USB cable 1 GPIO cable 1 power supply (-GP builds do not include power supply) **Note:** Package does not include mounting screws

Safety Notices and Warnings

General Safety

The modem is designed for and intended to be used in fixed and mobile applications. Fixed means the device is physically secured at one location and cannot be easily moved to another location. Mobile means the device is used in other than fixed locations.

CAUTION: Maintain a separation distance of at least 20 cm (8 inches) between the transmitter's antenna and the body of the user or nearby persons. The modem is not designed for or intended to be used in portable applications within 20 cm (8 inches) of the user's body.
Attention: Maintenir une distance d'au moins 20 cm (8 po) entre l'antenne du récepteur et le corps de l'utilisateur ou à proximité de personnes. Le modem n'est pas conçu pour, ou destinés à être utilisés dans les applications portables, moins de 20 cm du corps de l'utilisateur.

Radio Frequency (RF) Safety

Due to the possibility of radio frequency (RF) interference, it is important that you follow any special regulations regarding the use of radio equipment. Follow the safety advice given below.

- Operating your device close to other electronic equipment may cause interference if the equipment is inadequately protected. Observe any warning signs and manufacturers' recommendations.
- Different industries and businesses restrict the use of cellular devices. Respect restrictions on the use of radio equipment in fuel depots, chemical plants, or where blasting operations are in process. Follow restrictions for any environment where you operate the device.
- Do not place the antenna outdoors.
- Switch OFF your wireless device when in an aircraft. Using portable electronic devices in an aircraft may endanger aircraft operation, disrupt the cellular network, and is illegal. Failing to observe this restriction may lead to suspension or denial of cellular services to the offender, legal action, or both.
- Switch OFF your wireless device when around gasoline or diesel-fuel pumps and before filling your vehicle with fuel.
- Switch OFF your wireless device in hospitals and any other place where medical equipment may be in use.

Sécurité relative au bâti

Lors de l'installation de l'unité dans une enceinte pouvant en héberger plusieurs, suivez la procédure d'installation du fabricant de l'enceinte.

Note: La température ambiante à l'intérieur du bâti ne doit pas dépasser 40° Celsius.

- Ne placez pas l'unité directement sur le dessus ou en dessous d'un autre équipement.
- Si l'unité est installée dans une enceinte pouvant en héberger plusieurs, veillez à ce que l'air circule correctement dans le bâti afin que la température ambiante maximale recommandée (40° C) ne soit pas dépassée.
- Veillez à ce que l'unité soit correctement mise à la terre en vérifiant la fiabilité du raccordement de terre lorsque l'unité est installée dans un bâti.
- Si une multiprise est utilisée, veillez à ce qu'elle fournisse une mise à la terre appropriée à l'appareil qui y est branché.

- Lors de l'installation de l'équipement dans un bâti, veillez à ce que la charge mécanique soit homogène de sorte à éviter toute situation potentiellement dangereuse. Le bâti doit supporter le poids de l'ensemble des équipements qu'il contient.
- Assurez-vous que le circuit d'alimentation principale est capable de gérer la charge de l'équipement. Consultez l'étiquette d'alimentation sur l'équipement pour connaître les spécifications relatives aux charges.
- Cet équipement ne doit être installé que par un technicien de maintenance dûment qualifié. Ne raccordez des circuits que s'ils sont du même type: raccordez un circuit STBT (Secondaire Très Basse Tension) à un autre circuit STBT et un circuit RT (Réseau de télécommunications) à un autre circuit RT.

Interference with Pacemakers and Other Medical Devices

Potential interference

Radiofrequency energy (RF) from cellular devices can interact with some electronic devices. This is electromagnetic interference (EMI). The FDA helped develop a detailed test method to measure EMI of implanted cardiac pacemakers and defibrillators from cellular devices. This test method is part of the Association for the Advancement of Medical Instrumentation (AAMI) standard. This standard allows manufacturers to ensure that cardiac pacemakers and defibrillators are safe from cellular device EMI.

The FDA continues to monitor cellular devices for interactions with other medical devices. If harmful interference occurs, the FDA will assess the interference and work to resolve the problem.

Precautions for pacemaker wearers

If EMI occurs, it could affect a pacemaker in one of three ways:

- Stop the pacemaker from delivering the stimulating pulses that regulate the heart's rhythm.
- Cause the pacemaker to deliver the pulses irregularly.
- Cause the pacemaker to ignore the heart's own rhythm and deliver pulses at a fixed rate.

Based on current research, cellular devices do not pose a significant health problem for most pacemaker wearers. However, people with pacemakers may want to take simple precautions to be sure that their device doesn't cause a problem.

- Keep the device on the opposite the side of the body from the pacemaker to add extra distance between the pacemaker and the device.
- Avoid placing a turned-on device next to the pacemaker (for example, don’t carry the device in a shirt or jacket pocket directly over the pacemaker).

Vehicle Safety

When using your device in a vehicle:

- Do not use this device while driving.
- Respect national regulations on the use of cellular devices in vehicles.
- If incorrectly installed in a vehicle, operating the wireless device could interfere with the vehicle’s electronics. To avoid such problems, use qualified personnel to install the device. The installer should verify the vehicle electronics are protected from interference.
- Using an alert device to operate a vehicle’s lights or horn is not permitted on public roads.

- UL evaluated this device for use in ordinary locations only. UL did NOT evaluate this device for installation in a vehicle or other outdoor locations. UL Certification does not apply or extend to use vehicles or outdoor applications or in ambient temperatures above 40° C.

User Responsibility

Respect all local regulations for operating your wireless device. Use the security features to block unauthorized use and theft.

Device Maintenance

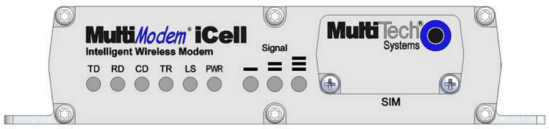
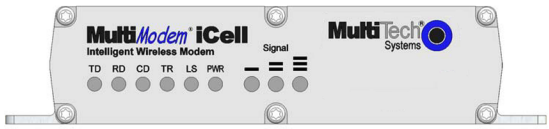
When maintaining your device:

- Do not attempt to disassemble the device. There are no user serviceable parts inside.
- Do not expose your device to any extreme environment where the temperature or humidity is high.
- Do not expose the device to water, rain, or spilled beverages. It is not waterproof.
- Do not place the device alongside computer discs, credit or travel cards, or other magnetic media. The information contained on discs or cards may be affected by the device.
- Using accessories, such as antennas, that Multi-Tech has not authorized or that are not compliant with Multi-Tech's accessory specifications may invalidate the warranty.

If the device is not working properly, contact Multi-Tech Technical Support.

LEDs, Connectors, and Specifications

Front

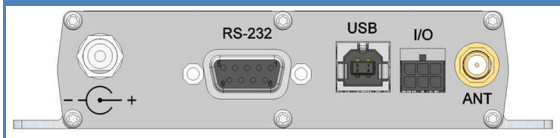
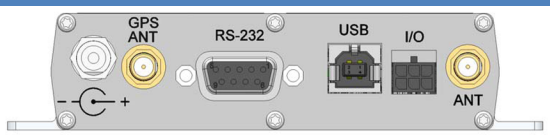
MTCMR-E1, -G2, -H5	MTCMR-C1, -C2, -EV2, -EV3
	

LEDs

LED	Description		
TD	**Transmit Data:** Lights when device transmits data. Not valid while in USB mode.		
RD	**Receive Data:** Lights when device receives data. Not valid while in USB mode.		
CD	**Carrier Detect:** Lights when there is a data connection. Not valid while in USB mode.		
LS	**Link Status:** LED behavior depends on model.		
	H5, C2, EV3, and EV2 models	**G2 and C1 models**	**E1 model** **Note:** Set AT^SSYNC to 1 for the following default LED timings:
	Continuous ON indicates device is powered on and registered on the network.	Continuous ON indicates device is not registered on the network.	Continuous ON indicates connected to remote party (CSD call).
	Slow flashing (5 seconds) indicates device is on and searching for a network.	Flashing at 200 ms on / 2 sec indicates registration on network.	**Flashing at 600 ms on/600 ms off** is limited network service: No SIM card inserted or no PIN entered, or network search in progress or ongoing user authentication, or network login in progress.
	Fast flashing (0.3 seconds) indicates device is transmitting or receiving.	Flashing at 200 ms on / 600 ms off indicates it is registered on a network and communication is in progress.	**Flashing at 75 ms on/3 sec off** is idle mode: Registered to the GSM network (monitoring control channels and user interactions). No call is in progress.

LED	Description		
	OFF indicates device is turned off or not powered.	OFF indicates device is turned off or in download mode.	**Flashing at 75 ms on/ 75 ms off/75 ms on/3 sec off** indicates one or more GPRS contexts activated.
			Flashing at 500 ms on/ 25 ms off indicates packet switched data transfer in progress.
			OFF indicates ME is in one of the following modes: power down mode, airplane mode, non-cyclic sleep mode with no temporary wake-up event in progress.
TR	**Terminal Ready:** Indicates a readiness signal from the PC.		
PWR/GPS	**Power:** Lights device has DC power.		
	GPS: If device has valid GPS signal, LED blinks at 1 second ON and 0.5 second OFF. If invalid GPS signal, LED is solid.		
Signal	■ **ALL OFF** – Unit is off, not registered on a network or has an extremely weak signal (0 < = RSSI < 6). ■ **1 Bar ON** – Very weak signal (7 < = RSSI < 14) ■ **1 and 2 Bars ON** – Weak signal (15 < = RSSI < 23) ■ **1, 2, and 3 Bars ON** – Good signal (24 < = RSSI < 31)		

Back

MTCMR No GPS	MTCMR with GPS
	

MTCMR-H5 Specifications

Category	Description
General	
Performance	HSPA+
Frequency Bands	Penta band 850/900/1700/1900/2100 MHz
Speed	
Packet Data	HSDPA data service of up to 21.0 Mbps
	HSUPA data service of up to 5.76 Mbps
Physical Description	
Weight	0.45 lbs. (200 g)
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style
Power	2.5mm miniature (screw-on)
USB	Type B
SIM Holder	Standard 1.8V and 3V
Environment	
Operating Temperature	-22° to 158° F (-30° to 70° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS	
SMS	Point-to-Point messaging
	Text and PDU
	Cell broadcast
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B

Category	Description
Radio Compliance	FCC Part 22
	FCC Part 24
	RSS 132
	RSS 133
	EN 301 511
	EN 301 489-1
	EN 301 489-3 (GPS models only)
	EN 301 489-7
	EN 301 489-24
	EN 301 908
	AS/ACIF S042.1, S042.3
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1
Network Compliance	PTCRB
	AT&T

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-EV3 Specifications

Category	Description
General	
Performance	EV-DO Rev A
Frequency Bands	Dual band 900/1800 MHz
Speed	
Packet Data	Up to 3.1M downlink and 5.76M bps uplink
Physical Description	
Weight	0.45 lbs. (200 g)
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style

Category	Description
Power	2.5mm miniature (screw-on)
USB	Type B
Environment	
Operating Temperature	-22° to 185° F (-30° to 85° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS	
SMS	Point-to-Point messaging
	Text and PDU
	Cell broadcast
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B
	EN55024
Radio Compliance	FCC Part 22
	FCC Part 24
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-EV2 Specifications

Category	Description
General	
Performance	EV-DO Rev A backwards compatible to EV-DO Rev 0 and CDMA2000 1xRTT
Frequency Bands	Dual band 800/1900 MHz
Speed	
Packet Data	Up to 3.1 Kbps download and 1.8 Kbps upload.
Circuit Switched Data	IS-95A, IS-95B up to 14.4K bps
Physical Description	
Weight	0.45 lbs. (200 g)

Category	Description
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style
Power	2.5mm miniature (screw-on)
USB	Type B
Environment	
Operating Temperature	-22° to 185° F (-30° to 85° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS, Wi-Fi, Bluetooth	
SMS	Point-to-Point messaging
	Text and PDU
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B
Radio Compliance	FCC Part 22
	FCC Part 24
Safety Compliance	UL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-G2 Specifications

Category	Description
General	
Performance	GPRS: Class 10
Frequency Bands	Quad-band GSM/GPRS/EDGE: 850/900/1800/1900 MHz
Speed	
Packet Data	Up to 85.6K bps, coding schemes CS1 to CS4
Circuit Switched Data	Up to 14.4 Kbps transparent and non-transparent
Physical Description	
Weight	0.45 lbs. (200 g)
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style
Power	2.5mm miniature (screw-on)
USB	Type B
SIM Holder	Standard 1.8V and 3V
Environment	
Operating Temperature	-40° to 185° F (-40° to 85° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS, Wi-Fi, Bluetooth	
SMS	Point-to-Point messaging
	Text and PDU
	Cell broadcast
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B

Category	Description
Radio Compliance	FCC Part 22
	FCC Part 24
	RSS 132
	RSS 133
	EN 301 511
	EN 301 489-1
	EN 301 489-3 (GPS models only)
	EN 301 489-7
	EN 301 908
	AS/ACIF S042.1, S042.3
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1
Network Compliance	PTCRB
	AT&T

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-C1 Specifications

Category	Description
General	
Performance	CDMA2000 1xRTT
Frequency Bands	Dual band 800/1900 MHz
Speed	
Packet Data	Up to 153.6K bps forward and reverse
Circuit Switched Data	IS-95A, IS-95B up to 14.4K bps forward and reverse
Physical Description	
Weight	0.45 lbs. (200 g)
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style

Category	Description
Power	2.5mm miniature (screw-on)
USB	Type B
Environment	
Operating Temperature	-40° to 185° F (-40° to 85° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS	
SMS	Point-to-Point messaging
	Text and PDU
	Cell broadcast
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B
Radio Compliance	FCC Part 22
	FCC Part 24
	RSS 132
	RSS 133
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-C2 Specifications

Category	Description
General	
Performance	2G CDMA 1xRTT
Frequency Bands	Dual-band 800/1900 MHz CDMA
Speed	
Packet Data	Peak downlink speeds up to 153 Kbps Peak uplink speeds up to 153 Kbps
Physical Description	
Weight	0.45 lbs. (200 g)

Category	Description
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style
Power	2.5mm miniature (screw-on)
USB	Type B
Environment	
Operating Temperature	-22° to 185° F (-30° to 85° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS	
SMS	Point-to-Point messaging
	Text and PDU
Certifications and Compliance	
EMC Compliance	FCC Part 15 Class B
	EN55022 Class B
Radio Compliance	FCC Part 22
	FCC Part 24
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

MTCMR-E1 Specifications

Category	Description
General	
Performance	EDGE: E-GPRS Class 12
	GPRS: Class 10
Frequency Bands	Quad-band GSM/GPRS/EDGE: 850/900/1800/1900 MHz
Speed	

Category	Description
Packet Data	EDGE: E-GPRS Up to 240K bps, coding scheme MCS 1-9, mobile station Class B, LLC layer, 4 time slots.
	GPRS: Full PBCCH support, coding scheme 1-4, mobile station Class B
Circuit Switched Data	Up to 14.4K bps, non-transparent
Physical Description	
Weight	0.45 lbs. (200 g)
Dimensions	3.1 in x 4.9 in x 1.1 in (7.9 cm x 12.4 cm x 2.8 cm)
Connectors	
Cellular	50 ohm SMA (female connector)
RS-232	DE9
GPIO	6 pin 2x3 style
Power	2.5mm miniature (screw-on)
USB	Type B
SIM Holder	Standard 1.8V and 3V
Environment	
Operating Temperature	-22° to 158° F (-30° to 70° C)[1]
Humidity	20%-90% relative humidity, non-condensing
Power Requirements	
Voltage	9V to 32V DC
SMS, Wi-Fi, Bluetooth	
SMS	Point-to-Point messaging
	Text and PDU
	Cell broadcast
Certifications and Compliance	
EMC Compliance	EN55022 Class B

Category	Description
Radio Compliance	FCC Part 22
	FCC Part 24
	RSS 132
	RSS 133
	EN 301 511
	EN 301 489-1
	EN 301 489-3 (GPS models only)
	EN 301 489-7
	EN 301 908
	AS/ACIF S042.1, S042.3
Safety Compliance	UL/cUL 60950-1 2nd Ed
	IEC60950-1 2nd Ed am.1
Network Compliance	PTCRB
	AT&T

[1]UL Listed at 40° C, limited by power supply. UL Certification does not apply or extend to an ambient above 40° C and has not been evaluated by UL for ambient greater than 40° C. “UL has evaluated this device for use in ordinary locations only. Installation in a vehicle or other outdoor locations has not been evaluated by UL. UL Certification does not apply or extend to use in vehicles or outdoor applications or in ambient above 40° C.”

Power Measurements

Multi-Tech Systems, Inc. recommends that you incorporate a 10% buffer into your power source when determining product load.

Note: Note the following:

- **Maximum:** The continuous current during maximum data rate with the radio transmitter at maximum power.
- **Peak:** The peak current during a transmission burst period.
- **In-rush Current:** The input current during power up, or a reset.

MTCMR-H5

GSM 850

	Idle	Typical	Maximum	Peak TX	In-rush Current
9 volts					
Current (AMPS)	0.057	0.080	0.185	1.18	1.61
Watts	0.526	0.740	1.700		
20 volts					
Current (AMPS)	0.030	0.044	0.087	0.530	1.71
Watts	0.600	0.880	1.740		
32 volts					
Current (AMPS)	0.021	0.031	0.054	0.332	1.46
Watts	0.672	0.992	1.73		

HSPA+

	Idle	Typical	Maximum	Peak TX	In-rush Current
9 volts					
Current (AMPS)	0.057	0.140	0.270	0.340	1.61
Watts	0.526	1.290	2.47		
20 volts					
Current (AMPS)	0.030	0.070	0.131	0.196	1.71
Watts	0.600	1.400	2.62		
32 volts					
Current (AMPS)	0.021	0.048	0.086	0.152	1.46
Watts	0.672	1.54	2.75		

MTCMR-H5-GP

GSM 850

	Idle	Typical	Maximum	Peak TX	In-rush Current
9 volts					
Current (AMPS)	0.097	0.125	0.225	1.32	1.63
Watts	0.895	1.150	2.070		
20 volts					
Current (AMPS)	0.051	0.063	0.108	0.570	1.74
Watts	1.020	1.260	2.160		
32 volts					
Current (AMPS)	0.035	0.043	0.072	0.340	1.47
Watts	1.120	1.380	2.300		

HSPA+

	Idle	Typical	Maximum	Peak TX	In-rush Current
9 volts					
Current (AMPS)	0.096	0.182	0.310	0.384	1.63
Watts	0.890	1.670	2.840		
20 volts					
Current (AMPS)	0.051	0.092	0.153	0.220	1.74
Watts	1.020	1.840	3.060		
32 volts					
Current (AMPS)	0.035	0.062	0.100	0.164	1.47
Watts	1.120	1.980	3.200		

MTCMR-EV3

CDMA 2000

	Typical	Maximum	Peak TX	In-rush Current
9 volts				
Current (AMPS)	0.121	0.330	0.404	2.55
Watts	1.09	2.97		
20 volts				
Current (AMPS)	0.061	0.155	0.228	1.89
Watts	1.22	3.10		
32 volts				

	Typical	Maximum	Peak TX	In-rush Current
Current (AMPS)	0.045	0.107	0.176	1.70
Watts	1.44	3.42		

EV-DO

	Typical	Maximum	Peak TX	In-rush Current
9 volts				
Current (AMPS)	0.118	0.275	0.360	2.55
Watts	1.06	2.48		
20 volts				
Current (AMPS)	0.061	0.133	0.204	1.89
Watts	1.22	2.66		
32 volts				
Current (AMPS)	0.043	0.091	0.156	1.70
Watts	1.38	2.91		

MTCMR-EV3-GP

CDMA 2000

	Typical	Maximum	Peak TX	In-rush Current
9 volts				
Current (AMPS)	0.160	0.354	0.430	2.42
Watts	1.44	3.19		
20 volts				
Current (AMPS)	0.086	0.173	0.24	1.86
Watts	1.72	3.46		
32 volts				
Current (AMPS)	0.049	0.110	0.18	1.65
Watts	1.57	3.52		

EV-DO

	Typical	Maximum	Peak TX	In-rush Current
9 volts				
Current (AMPS)	0.168	0.330	0.412	2.42
Watts	1.51	2.97		
20 volts				

	Typical	Maximum	Peak TX	In-rush Current
Current (AMPS)	0.084	0.158	0.232	1.86
Watts	1.68	3.16		
32 volts				
Current (AMPS)	0.056	0.105	0.176	1.65
Watts	1.79	3.36		

MTCMR-EV2

CDMA 2000

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.061	0.160	0.485
Watts	0.56	1.47	4.41
20 volts			
Current (AMPS)	0.030	0.081	0.230
Watts	0.60	1.62	4.60
32 volts			
Current (AMPS)	0.023	0.055	0.152
Watts	0.74	1.76	4.86

EV-DO

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.108	0.330	0.580
Watts	1.00	3.04	5.27
20 volts			
Current (AMPS)	0.052	0.165	0.313
Watts	1.04	3.30	6.26
32 volts			
Current (AMPS)	0.041	0.105	0.205
Watts	1.31	3.36	6.56

MTCMR-EV2

CDMA 2000

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.119	0.220	0.560
Watts	1.10	2.02	5.09
20 volts			
Current (AMPS)	0.062	0.110	0.265
Watts	1.24	2.20	5.30
32 volts			
Current (AMPS)	0.044	0.075	0.175
Watts	1.141	2.40	5.60

EV-DO

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.167	0.370	0.625
Watts	1.54	3.40	5.68
20 volts			
Current (AMPS)	0.087	0.192	0.345
Watts	1.74	3.84	6.90
32 volts			
Current (AMPS)	0.062	0.121	0.225
Watts	1.198	3.87	7.20

MTCMR-G2

	Sleep	Typical	Maximum	Peak TX
9 volts				
Current (AMPS)	0.069	0.109	0.194	1.53
Watts	0.640	1.010	1.790	
20 volts				
Current (AMPS)	0.038	0.056	0.096	0.668
Watts	0.760	1.120	1.920	
32 volts				
Current (AMPS)	0.030	0.041	0.065	0.453
Watts	0.960	1.300	2.100	

MTCMR-G2-GP

	Sleep	Typical	Maximum	Peak TX
9 volts				
Current (AMPS)	0.083	0.130	0.233	1.83
Watts	0.770	1.190	2.130	
20 volts				
Current (AMPS)	0.046	0.067	0.115	0.801
Watts	0.920	1.340	2.300	
32 volts				
Current (AMPS)	0.036	0.050	0.078	0.543
Watts	1.150	1.600	2.500	

MTCMR-C1

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.048	0.128	0.360
Watts	0.44	1.18	3.31
20 volts			
Current (AMPS)	0.027	0.065	0.171
Watts	0.54	1.30	3.42
32 volts			
Current (AMPS)	0.021	0.046	0.115

	Sleep	Typical	Maximum
Watts	0.67	1.47	3.68

MTCMR-C1-GP

	Sleep	Typical	Maximum
9 volts			
Current (AMPS)	0.096	0.175	0.435
Watts	0.89	1.62	4.00
20 volts			
Current (AMPS)	0.052	0.092	0.205
Watts	1.04	1.84	4.10
32 volts			
Current (AMPS)	0.037	0.062	0.135
Watts	1.18	1.98	4.32

MTCMR-C2

		Idle	Typical	Maximum	Peak	Inrush
9 volts						
PCS (1900 MHz)	Current (AMPS)	0.079	0.118	0.424	0.463	2.09
	Watts	0.73	1.09	3.03		
20 volts						
PCS (1900 MHz)	Current (AMPS)	0.042	0.054	0.195	0.239	1.81
	Watts	0.0.84	1.10	3.06		
32 volts						
PCS (1900 MH)	Current (AMPS)	0.029	0.051	0.137	0.176	1.35
	Watts	0.93	1.63	4.38		

MTCMR-C2-GP

		Idle	Typical	Maximum	Peak	Inrush Current
9 volts						
PCS (1900 MHz)	Current (AMPS)	0.119	0.158	0.448	0.488	2.09
	Watts	1.10	1.46	4.10		
20 volts						
PCS (1900 MHz)	Current (AMPS)	0.061	0.079	0.213	0.252	1.81
	Watts	1.22	1.58	4.26		
32 volts						
PCS (1900 MH)	Current (AMPS)	0.043	0.055	0.140	0.18	1.35
	Watts	1.38	1.76	4.48		

MTCMR-E1

	Sleep	Typical	Maximum	Peak TX
9 volts				
Current (AMPS)	0.091	0.149	0.416	2.5
Watts	0.84	1.37	3.77	
20 volts				
Current (AMPS)	0.048	0.077	0.190	0.895
Watts	0.96	1.54	3.80	
32 volts				
Current (AMPS)	0.034	0.054	0.124	0.625
Watts	1.088	1.73	3.97	

MTCMR-E1-GP

	Sleep	Typical	Maximum	Peak TX
9 volts				
Current (AMPS)	0.098	0.160	0.410	2.25
Watts	0.91	1.48	3.77	

	Sleep	Typical	Maximum	Peak TX
20 volts				
Current (AMPS)	0.051	0.080	0.190	0.890
Watts	1.02	1.60	3.80	
32 volts				
Current (AMPS)	0.035	0.056	0.122	0.609
Watts	1.125	1.79	3.90	

RF Specifications

	GSM 850	EGSM 900	GSM 1800	GSM 1900	CDMA 800	CDMA 1900
Frequency RX	869 to 894 MHz	925 to 960 MHz	1805 to 1800 MHz	1930 to 1990 MHz	869 to 894 MHz	1930 to 1990 MHz
Frequency TX	824 to 849 MHz	880 to 915 MHz	1710 to 1785 MHz	1850 to 1910 MHz	824 to 849 MHz	1850 to 1910 MHz
RF Power Stand	2W at 12.5% duty cycle	2W at 12.5% duty cycle	1W at 12.5% duty cycle	1W at 12.5% duty cycle	--	--

Antenna Information

PTCRB Requirements

There cannot be any alteration to the authorized antenna system. The antenna system must be the same type with similar in-band and out-of-band radiation patterns and maintain the same specifications.

Cellular Antenna Information

Authorized Antenna/Antenna Specifications for Cellular Bands

The cellular radio portion of the device is approved with the following antenna or for alternate antennas meeting the given specifications.

Manufacturer:	Laird Technologies.
Description:	HEPTA-SM
Model Number:	MAF94300
Multi-Tech Part Number:	45009735L

Multi-Tech ordering information:

Model	Quantity
ANHB-1HRA	1
ANHB-10HRA	10
ANHB-50HRA	50

3G Antenna Requirements/Specifications

Category	Description	
Frequency Range	824 – 960 MHz / 1710 – 1990 MHz / 1920 – 2170 MHz	
Impedance	50 Ohms	
VSWR	VSWR should not exceed 2.0:1 at any point across the bands of operation	
Typical Radiated Gain	850 MHz	3.17 dBi
	950 MHz	3.51 dBi
	1800 MHz	3.55 dBi
	1900 MHz	3.0 dBi
	2100 MHz	3.93 dBi
Radiation	Omni-directional	
Polarization	Linear Vertical	

EV-DO and CDMA Antenna Information

EV-DO and CDMA Authorized Antennas

These devices were approved with the following antenna:

Manufacturer:	Exceltek Electronics Ltd.
Manufacturer's Model Number:	C0081-ANG0002

Multi-Tech ordering information:

Model	Quantity
ANQB-1HRA	1
ANQB-10HRA	10
ANQB-50HRA	50

EV-DO and CDMA Antenna Requirements

Category	Description
Frequency Range	824 - 894 MHz / 1850 - 1990 MHz
Impedance	50 Ohms
VSWR	VSWR should not exceed 2.0:1 at any point across the bands of operation
Typical Radiated Gain	2 dBi on azimuth plane
Radiation	Omni-directional
Polarization	Linear vertical

GSM/EGSM Antenna Requirements/Specifications

Category	Description
Frequency Range	824—960 MHz / 1710—1990 MHz
Impedance	50 Ohms
VSWR	VSWR should not exceed 2.0:1 at any point across the bands of operation
Typical Radiated Gain	3 dBi on azimuth plane
Radiation	Omni-directional
Polarization	Linear Vertical
Wave	Half Wave Dipole

FCC Requirements Note

FCC Requirements Note The antenna gain, including cable loss, for the radio you are incorporating into your product design must not exceed the requirements at 850 MHz and 1900 MHz as specified by the FCC grant for mobile operations and fixed mounted operations as defined in 2.1091 and 1.1307 of the FCC rules for satisfying RF exposure compliance. The antenna used for transmitting must be installed to provide a separation distance of at least 20 cm from all persons and must not transmit simultaneously with any other antenna transmitters. User and installers must be provided with antenna installation instructions and transmitter operating conditions to satisfying RF exposure compliance.

Global Positioning System (GPS)

This information applies only to the models with the GPS option.

Category	Description
Receiver Type	L1 Frequency GPS C/A code SBAS Capable 51 Channel Acquisitions 14 Channel Tracking
Sensitivity Tracking	-161dBm
Accuracy	Position 2.5m CEP Velocity 0.1m/sec
Update Rate	1Hz standard
Dynamics	4G
Open Sky TTFF	Hot start 1 second Cold start 29 seconds average Reacquisition < 1s
Operational Limits	Altitude < 18,000m or Velocity < 515m/s
Datum	Default WGS-84

Category	Description
Interface	UART
Protocol	NMEA-0183 V3.01, GGA, GLL, GSA, GSV, RMC, VTG

Underwriters Laboratories, Inc. Global Positioning System (GPS) Statement

Underwriters Laboratories Inc.(“UL”) has not tested the performance or reliability of the Global Positioning System (“GPS”) hardware, operating software or other aspects of this product. UL has only tested for fire, shock or casualties as outlined in UL’s Standard(s) for Safety. UL60950-1 Certification does not cover the performance or reliability of the GPS hardware and GPS operating software. UL MAKES NO REPRESENTATIONS, WARRANTIES OR CERTIFICATIONS WHATSOEVER REGARDING THE PERFORMANCE OR RELIABILITY OF ANY GPS RELATED FUNCTIONS OF THIS PRODUCT.

Connecting Direct DC Power accessories

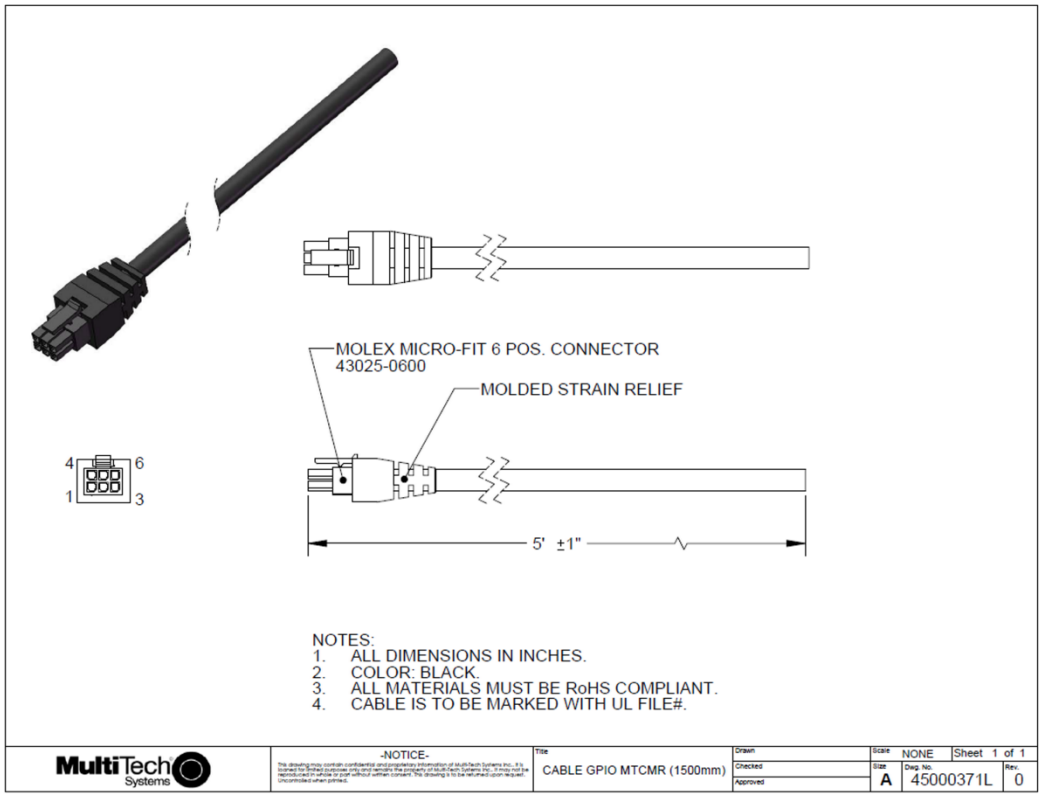
To connect direct DC power in a vehicle:

Note: The device has over-voltage protection. To ensure complete protection, you can add additional filtering to the DC input.
Note: For automotive applications you can use permanent “+” or keyswitched “+” source.

1. Connect the DC power cable to the power connector on the modem.
2. Attach the two wires at the DC power cable's other end to a DC fuse/terminal block where you are mounting the device.
3. Connect red wire to the "+" (positive) terminal and black wire to the "–" (negative) terminal.
4. Verify the ground connection is correct.

GPIO

GPIO Cable



GPIO Connector

Use Universal IP (UIP) AT Commands to configure GPIO pins. Refer to the Universal IP (UIP) AT Command Reference Guide for more information.

Pin Number	Description	GPIO 6-pin Connector
Pin 1	DIO 0	
Pin 2	DIO 1	
Pin 3	DIO 2/ADC 0	
Pin 4	DIO 3/ADC 1	
Pin 5	ADC2	
Pin 6	Gnd	

You can program GPIO pins independently.

- Pin 1 Digital Input, 24 Volt tolerant.
- Pin 2 Digital Input, 24 Volt tolerant.
- Configure Pin 3 as either Digital Input (5V tolerant TTL/CMOS levels), Digital Output (3.3V High) or as an ADC input (0 to 3.3V rail)

- Configure Pin 4 as either Digital Input (5V tolerant TTL/CMOS levels), Digital Output (3.3V High) or as an ADC input (0 to 3.3V rail)
- Pin 5, ADC input (0 to 3.3V rail)
- Pin 6 is GND and must be connected to the ground of the attached device

GPIO DC Characteristics

Pins 1-5 contain ESD protection.

Pins 1, 2 Input Voltage

Parameter	Min	Max	Units
Input Low-level Voltage	0.3	1.0	V
Input High-level Voltage	3.0	24	V

Pins 1,2 are digital input only.

Pins 3,4 Input Voltage

Parameter	Min	Max	Units
Input Low-level Voltage	-0.3	0.8	V
Input High-level Voltage	2.0	5.5	V

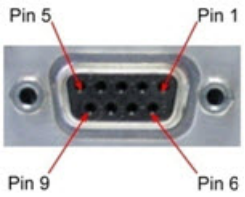
Pins 3,4 Output Voltage

Parameter	Min	Max	Units
Output Low-level Voltage	0.0	0.4	V
Output High-level Voltage	2.9	3.3	V

Pins 3,4 Output Current

Parameter	Min	Max	Units
Output Current	-	2	mA

RS-232 9-Pin Female Connector



Pin	Abbreviation	Description	In/Out
1	CD	Carrier Detect	O
2	RX	Receive	O

Pin	Abbreviation	Description	In/Out
3	TX	Transmit	I
4	DTR	Data Terminal Ready	I
5	GND	Ground	--
6	DSR	Data Set Ready	O
7	RTS	Request to Send	I
8	CTS	Clear to Send	O
9	RI	Ring Indicator	O

Device Activation and Installation

Account Activation for Cellular Devices

Some Multi-Tech cellular modems are pre-configured to operate on a specific cellular network. Before you can use the modem, you must set up a cellular data account with your service provider. Each service provider has its own process for adding devices to their network. Refer to Multi-Tech's Cellular Activation site http://www.multitech.com/activation.go for step-by-step instructions on activating your cellular modem with your service provider.

Device Phone Number

Every device has a unique phone number. Your service provider supplies a phone number when you activate your account, or if your device has a SIM card, the phone number may be on it. Wireless service provider implementation may vary. Consult with your service provider to get the phone number for your device.

Notice for Devices that Use Aeris Radios

One component of your device is a radio. A radio algorithm prevents your device from repeatedly attempting to connect to the network when the radio:

- Cannot establish a packet data connection or
- Fails to access the application server.

When writing applications for your devices, ensure that your applications do not interfere with the radio's connection retry algorithm. If you fail to do so, Aeris might block network access for your devices.

After your devices reach the end of their commercial lifespan, you must remove them from the Aeris network. To do so, remove power from the devices and remove their antennas. If your devices continue to attempt to register with the network after you cancel device subscriptions, Aeris can bill you for any traffic generated by those devices.

Installing and Removing SIM Cards

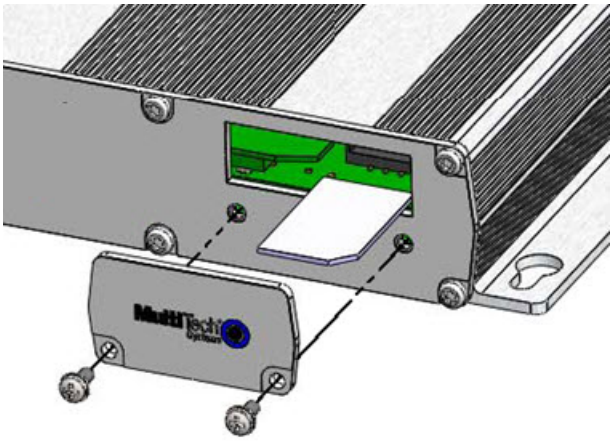
Installing a SIM Card

Some models require a SIM card, which is supplied by your service provider. To install the SIM card:

You need:

- Phillips screwdriver
- SIM card

1. Disconnect power, if it is connected.
2. Use a small Phillips screwdriver to remove the two SIM cover screws and remove the SIM door.



3. Insert the SIM card into the card holder with the contact side facing down as shown.
4. Verify that the SIM card fits into the holder properly and replace the cover.

Removing a SIM Card

To remove the SIM card:

You need:

- Phillips screwdriver
- Needle-nose pliers

1. Disconnect power, if it is connected.
2. Use a small Phillips screwdriver to remove the two SIM cover screws and remove the SIM door.
3. Use a needle-nose pliers to grasp the SIM card and pull it from the card holder. Do not touch the contact with the pliers.

Attaching Power Supply Blades

Power Supply and Blades

If your device shipped with a power cord, attach the blades for your region.

Power Supply no blades

Power Supply with EU blade

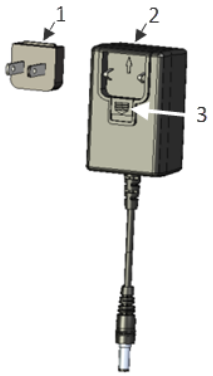
Power Supply with NAM blade

Power Supply with UK blade

Attaching the Blades

To attach a power supply blade:

1. Remove the power supply cover (not shown). To do this, slide the lock down and hold it while you lift off the cover.
2. Insert the latch on the blade into the notch on the power supply.
3. Slide the lock down and hold it while you press the blade in place. Then, release it.



1 - Latch

2 - Notch

3 - Sliding lock

Connecting Antennas, Cables, and Power

To cable your device.

1. Connect your antenna to the SMA connector, labelled ANT.
2. If using a serial interface, connect the RS-232 cable to the RS-232 serial port on the device. Connect the cable's other end to your computer's serial port.
3. If using a USB interface, connect a USB cable to the USB port on the device. Connect the cable's other end to your computer's USB port.
4. Connect the GPIO cable to the I/O connector on the device and the other end to the external device.
5. Connect the power supply or DC power cable to the device. If using the power supply, refer to Attaching Power Supply Blades. If using a DC power cable, refer to Connecting Direct DC Power.
6. Plug the power supply into your power source.

Connecting Direct DC Power accessories

To connect direct DC power in a vehicle:

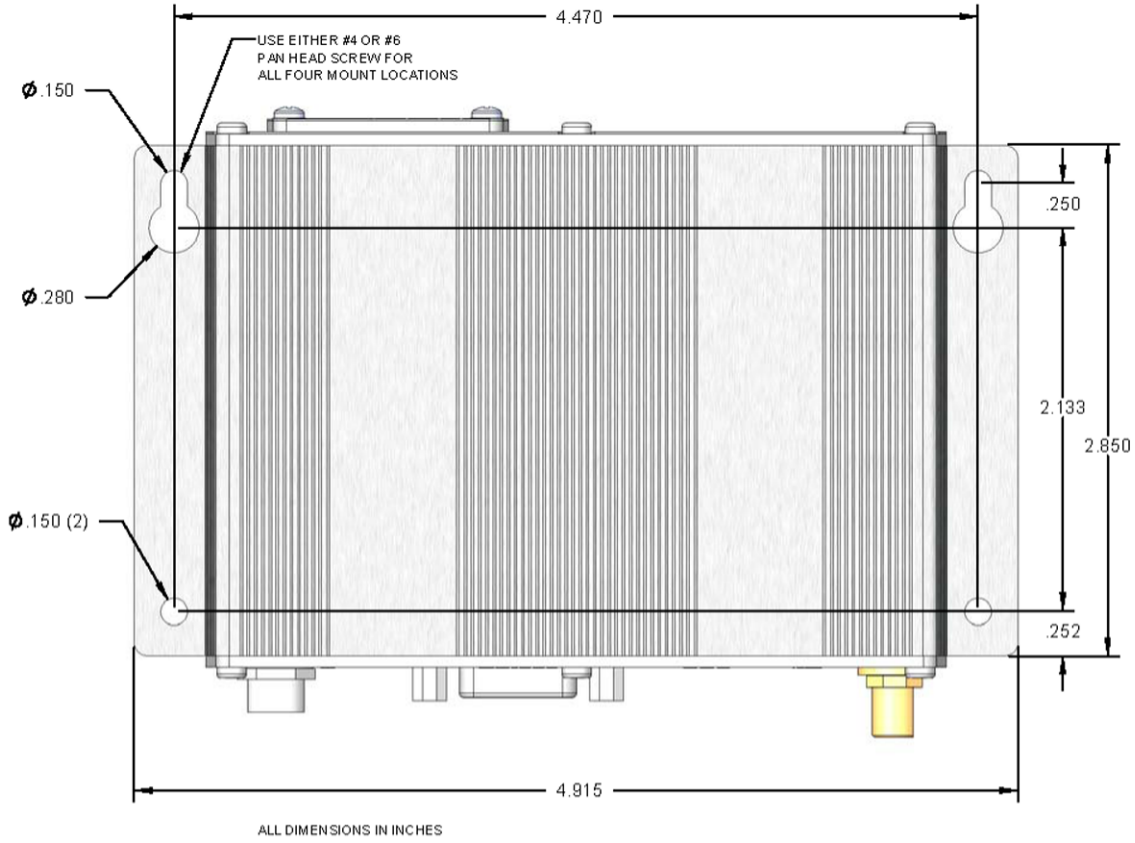
Note: The device has over-voltage protection. To ensure complete protection, you can add additional filtering to the DC input.
Note: For automotive applications you can use permanent “+” or keyswitched “+” source.

1. Connect the DC power cable to the power connector on the modem.
2. Attach the two wires at the DC power cable's other end to a DC fuse/terminal block where you are mounting the device.
3. Connect red wire to the "+" (positive) terminal and black wire to the "–" (negative) terminal.
4. Verify the ground connection is correct.

Mounting the Device on a Flat Surface

To permanently mounting the device:

- Verify the location has a strong signal strength.
- Position the device so the antenna is always vertical and pointing upward.
- Use the dimensions in the following image to space screw holes.
- Use either #4 or #6 pan head screws.



Installing Drivers

If your device has a SIM card, install it before installing drivers.

For Linux: This device is compatible with kernel 2.6 and higher. It uses the standard CDC-ACM driver.

For Windows: The following installation procedure is compatible with 32 and 64-bit versions of Microsoft Windows 7, 8, Vista, XP, and Server 2003/2008.

Note: If using Windows XP, you need Service Pack 3.

1. Download the driver from **multitech.com/support.go**.
2. Unzip the driver.
   For serial devices, skip to Step 5.
   For USB devices continue with Step 3.
3. Open the **Drivers** folder and run **install.bat.**
4. Connect the USB cable to the computer and your device.
5. In Windows, open **Phone and Modem** from the Control Panel.
6. Click the **Modems** tab and click **Add**.
7. Check **Don't detect my Modem** and click **Next**.

8. Click **Have Disk**.
9. Browse to the **Drivers** folder.
10. Select **MTSMCIP_MTCMRIP.INF** and click **Open**.
11. Select your device from the list and click **Next**.
12. Choose the **COM Port** your device is connected to and click **Next**.
13. Click **Finish** to complete the install.

Verifying that Modem Installed Successfully in Windows

To verify that device installed correctly:

1. In the Phone and Modem Options window, highlight your modem and click **Properties**.
2. Go to the **Diagnostics** tab and click **Query Modem**.

If the device is working, the Command and Response section lists the commands sent and their response. When you are done testing, close the Phone and Modem windows.

Note: If nothing appears in Command and Response, verify that you selected the correct modem. Click Query Modem again and check the device's LEDs. If you selected the correct device, the TR LED lights and the TD and RD LEDs blink.

Basic Operations

Device Phone Number

Every device has a unique phone number. Your service provider supplies a phone number when you activate your account, or if your device has a SIM card, the phone number may be on it. Wireless service provider implementation may vary. Consult with your service provider to get the phone number for your device.

Sending AT Commands

AT commands allow you to configure, operate, and query your device. To send AT commands, use terminal software such as HyperTerminal, TerraTerm, Kermit, or Putty.

Download the AT Command Reference Guide for your model from multitech.com/support.go.

Verifying Signal Strength

To verify the device signal strength, enter:

AT+CSQ

The command indicates signal quality, in the form:

+CSQ: <rssi>,<ber>

Where:

<rssi>	Received signal strength indication.
0	(-113) dBm or less
1	(-111) dBm
2-30	(-109) dBm - (-53) dBm / 2 dBm per step
31	(-51) dBm or greater
99	Not known or not detectable
<ber>	Bit error rate, in percent
0	Less than 0.2%
1	0.2% to 0.4%
2	0.4% to 0.8%
3	0.8% to 1.6%
4	1.6% to 3.2%
5	3.2% to 6.4%

6	6.4% to 12.8%
7	More than 12.8%
99	Not known or not detectable

Note: Signal strength of 10 or higher is needed for successful packet data sessions.

Example

A example response to AT+CSQ:

+CSQ: 15,1

Checking Network Registration

Before establishing a packet data connection, verify the is device registered on the network. To do this enter the network registration report read command:

AT+CREG?

If the device returns:

+CREG: 0,1

The device is registered.

If the device returns:

+CREG: 0,2

The device is in a network searching state.

Checking Network Registration for EV2 and C2

To verify that a device is registered on the network, enter:

AT!STATUS

The device returns several lines of modem status information. The second to last line indicates either:

Modem has registered.

or

Modem has NOT registered.

Connecting to the Internet

To access the Internet, establish a dial-up connection.

Note: For HSPA+, EDGE, and GPRS devices, setup your device's Access Point Number before creating the dial-up connections.

Creating a Windows Dial-Up Connection

Each version of the Windows operating system has different steps for creating dial-up Internet connections. Consult Windows Help for the specific steps for your version.

You may need the phone number, username, and password for your carrier.

Setting the Access Point Number (APN) in Modem's Properties

Some devices require an Access Point Number. If your service provider supplies an APN number for your account, enter it in the Phone and Modem Operations Window.

1. In Windows, open **Phone and Modem** from the Control Panel.
2. Open the **Properties** window for your modem..
3. On the Advanced tab, enter the following in **Extra initialization.**

AT+CGDCONT=1,"IP","<APN>"

Where <APN> is your Access Point Number, for example, AT+CGDCONT=1,"IP", "ISP.AT&T".

4. Close the Phone and Modem windows.

Creating a Dial-up Connection in Linux

To create a Linux dial-up connection:

1. Disable the IP stack
   Enter:
   AT+WOPEN=0
2. If required by your device, set up the APN.
   Enter:
   AT+CGDONT=1,"IP","<APN>"
   Where <APN> is the Access Point Number supplied by your service provider.
3. Dial the network.
   Enter:
   - For HSPA+, EDGE, or GPRS, use**ATD*99***1#**
   - For CDMA or EV-DO, use**ATD#777**

Setting the Serial Baud Rate

Your device defaults to a serial baud rate of 115200. Use AT+IPR=<baudspeed> to change the device to a higher speed. Options are 230400, 460800, or 921600.

Note: The host serial port must be capable of the new speed.

To reset the speed, change NVRAM settings.

1. Open a terminal program with the following settings:
   19200, 8, NONE, Hardware Flow Control
2. When the modem boots there is a 500ms window to enter the following AT command sequence:
   Enter:

Enter: **M**
Response: MU
Enter: D
Response: M
Enter: S
Response: S<cr><if><OK<cr><if>

Recovery

To do this manually:

1. Shut off the device.
2. Press **Caps Lock** and hold down **M**.
3. Turn on the device. MU displays.
4. Press**D** and **S** quickly.

Regulatory Statements

EMC, Safety, and R&TTE Directive Compliance

CE

The CE mark is affixed to this product to confirm compliance with the following European Community Directives:

> Council Directive 2004/108/EC of 15 December 2004 on the approximation of the laws of Member States relating to electromagnetic compatibility;
> and
> Council Directive 2006/95/EC of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
> and
> Council Directive 1999/5/EC of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

International Modem Restrictions

Some dialing and answering defaults and restrictions may vary for international modems. Changing settings may cause a modem to become non-compliant with national regulatory requirements in specific countries. Also note that some software packages may have features or lack restrictions that may cause the modem to become non-compliant.

47 CFR Part 15 Regulation Class B Devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Class B Notice

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Reglement Canadien sur le matériel brouilleur.

This device complies with Industry Canada RSS Appliance radio exempt from licensing. The operation is permitted for the following two conditions:

1. the device may not cause harmful interference, and
2. the user of the device must accept any interference suffered, even if the interference is likely to jeopardize the operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Environmental Notices

Waste Electrical and Electronic Equipment Statement

WEEE Directive

The WEEE Directive places an obligation on EU-based manufacturers, distributors, retailers, and importers to take-back electronics products at the end of their useful life. A sister directive, ROHS (Restriction of Hazardous Substances) complements the WEEE Directive by banning the presence of specific hazardous substances in the products at the design phase. The WEEE Directive covers all Multi-Tech products imported into the EU as of August 13, 2005. EU-based manufacturers, distributors, retailers and importers are obliged to finance the costs of recovery from municipal collection points, reuse, and recycling of specified percentages per the WEEE requirements.

Instructions for Disposal of WEEE by Users in the European Union

The symbol shown below is on the product or on its packaging, which indicates that this product must not be disposed of with other waste. Instead, it is the user's responsibility to dispose of their waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the product.

July, 2005

REACH Statement

Registration of Substances

After careful review of the legislation and specifically the definition of an “article” as defined in EC Regulation 1907/2006, Title II, Chapter 1, Article 7.1(a)(b), it is our current view Multi-Tech Systems, Inc. products would be considered as “articles”. In light of the definition in § 7.1(b) which requires registration of an article only if it contains a regulated substance that “is intended to be released under normal or reasonably foreseeable conditions of use,” Our analysis is that Multi-Tech Systems, Inc. products constitute nonregisterable articles for their intended and anticipated use.

Substances of Very High Concern (SVHC)

Per the candidate list of Substances of Very High Concern (SVHC) published October 28, 2008 we have reviewed these substances and certify the Multi-Tech Systems, Inc. products are compliant per the EU “REACH” requirements of less than 0.1% (w/w) for each substance. If new SVHC candidates are published by the European Chemicals Agency, and relevant substances have been confirmed, that exceeds greater than 0.1% (w/w), Multi-Tech Systems, Inc. will provide updated compliance status.

Multi-Tech Systems, Inc. also declares it has been duly diligent in ensuring that the products supplied are compliant through a formalized process which includes collection and validation of materials declarations and selective materials analysis where appropriate. This data is controlled as part of a formal quality system and will be made available upon request.

Restriction of the Use of Hazardous Substances (RoHS)

Multi-Tech Systems, Inc

Certificate of Compliance

2011/65/EU

Multi-Tech Systems confirms that its embedded products comply with the chemical concentration limitations set forth in the directive 2011/65/EU of the European Parliament (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment - RoHS).

These Multi-Tech products do not contain the following banned chemicals[1]:

- Lead, [Pb] < 1000 PPM
- Mercury, [Hg] < 1000 PPM
- Hexavalent Chromium, [Cr+6] < 1000 PPM
- Cadmium, [Cd] < 100 PPM
- Polybrominated Biphenyl, [PBB] < 1000 PPM
- Polybrominated Diphenyl Ether, [PBDE] < 1000 PPM

Environmental considerations:

- Moisture Sensitivity Level (MSL) =1
- Maximum Soldering temperature = 260C (in SMT reflow oven)

[1]Lead usage in some components is exempted by the following RoHS annex, therefore higher lead concentration would be found in some modules (>1000 PPM);

- Resistors containing lead in a glass or ceramic matrix compound.

Information on HS/TS Substances According to Chinese Standards

In accordance with China's Administrative Measures on the Control of Pollution Caused by Electronic Information Products (EIP) # 39, also known as China RoHS, the following information is provided regarding the names and concentration levels of Toxic Substances (TS) or Hazardous Substances (HS) which may be contained in Multi-Tech Systems Inc. products relative to the EIP standards set by China's Ministry of Information Industry (MII).

Hazardous/Toxic Substance/Elements

Name of the Component	Lead (PB)	Mercury (Hg)	Cadmium (CD)	Hexavalent Chromium (CR6+)	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Printed Circuit Boards	O	O	O	O	O	O
Resistors	X	O	O	O	O	O
Capacitors	X	O	O	O	O	O
Ferrite Beads	O	O	O	O	O	O
Relays/Opticals	O	O	O	O	O	O
ICs	O	O	O	O	O	O
Diodes/ Transistors	O	O	O	O	O	O
Oscillators and Crystals	X	O	O	O	O	O
Regulator	O	O	O	O	O	O
Voltage Sensor	O	O	O	O	O	O
Transformer	O	O	O	O	O	O
Speaker	O	O	O	O	O	O
Connectors	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
Screws, Nuts, and other Hardware	X	O	O	O	O	O
AC-DC Power Supplies	O	O	O	O	O	O
Software /Documentation CDs	O	O	O	O	O	O
Booklets and Paperwork	O	O	O	O	O	O
Chassis	O	O	O	O	O	O

X Represents that the concentration of such hazardous/toxic substance in all the units of homogeneous material of such component is higher than the SJ/Txxx-2006 Requirements for Concentration Limits.
O Represents that no such substances are used or that the concentration is within the aforementioned limits.

Information on HS/TS Substances According to Chinese Standards (in Chinese)

依照中国标准的有毒有害物质信息

根据中华人民共和国信息产业部 (MII) 制定的电子信息产品 (EIP) 标准－中华人民共和国《电子信息产品污染控制管理办法》（第 39 号），也称作中国 RoHS, 下表列出了 Multi-Tech Systems, Inc. 产品中可能含有的有毒物质 (TS) 或有害物质 (HS) 的名称及含量水平方面的信息。

有害/有毒物质/元素

成分名称	铅 (PB)	汞 (Hg)	镉 (CD)	六价铬 (CR6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板	O	O	O	O	O	O
电阻器	X	O	O	O	O	O
电容器	X	O	O	O	O	O
铁氧体磁环	O	O	O	O	O	O
继电器/光学部件	O	O	O	O	O	O
ICs	O	O	O	O	O	O
二极管/晶体管	O	O	O	O	O	O
振荡器和晶振	X	O	O	O	O	O
调节器	O	O	O	O	O	O
电压传感器	O	O	O	O	O	O
变压器	O	O	O	O	O	O
扬声器	O	O	O	O	O	O
连接器	O	O	O	O	O	O
LEDs	O	O	O	O	O	O
螺丝、螺母以及其它五金件	X	O	O	O	O	O
交流-直流电源	O	O	O	O	O	O
软件/文档 CD	O	O	O	O	O	O
手册和纸页	O	O	O	O	O	O
底盘	O	O	O	O	O	O

X 表示所有使用类似材料的设备中有害/有毒物质的含量水平高于 SJ/Txxx-2006 限量要求。
O 表示不含该物质或者该物质的含量水平在上述限量要求之内。

Index

A

Access Point Number 44 45
account activation 38
activation
  cellular devices 38
antenna 33
  CDMA 32
  connecting 40
  EV-DO 32
  FCC 33
  HSPA+ 31
APN 44 45

B

back panel 12
baud rate 45
buffer 23

C

cable 36
  GPIO 35
cables
  connecting 40
CDMA
  antenna 32
Chinese hazardous substances
  Chinese version 53
  English version 52
Class B 47
  Industry Canada 47
connector 36
connectors 12

D

DC power 34 40
device
  maintenance 10
dialing restrictions 47
dial-up connection 44 45
digital input 35
driver
  install 41

E

EGSM
  antenna requirements 33
EV2
  specifications 15
EV3
  specifications 14 19
EV-DO
  antenna 32

F

FCC
  antenna requirements 33
FCC Notice
  Class B 47
front panel 11

G

G2 17
  specification 17
GPIO 35
  cable 35 40
GPS 34
  specifications 33
GSM
  antenna requirements 33

H

H5
  specifications 13
hazardous substances 51
HSPA+
  antenna 31

I

Industry Canada
  Class B 47
in-rush current 23
install
  driver 41 42
  SIM card 38
Internet connection 44 45

L

LED 11
Linux 45

M

maintenance 10
maximum current 23
modem
  safety 8
MTCMR-C1 ....18 28
MTCMR-C1-GP 29
MTCMR-E1 ....20 30
MTCMR-E1-GP 30
MTCMR-EV2 ....26 29 30
MTCMR-EV2-GP 27
MTCMR-EV3 24
MTCMR-EV3-GP 25
MTCMR-G2 28
MTCMR-G2-GP 28
MTCMR-H5 23
MTCMR-H5-GP 24

N

network registration
  check 44

P

peak current 23
pins 35
power 34 40
  buffer 23
power draw
  MTCMR-C1 28
  MTCMR-C1-GP 29
  MTCMR-E1 30
  MTCMR-E1-GP 30
  MTCMR-EV2 ....26 29 30
  MTCMR-EV2-GP 27
  MTCMR-EV3 24
  MTCMR-EV3-GP 25
  MTCMR-G2 28
  MTCMR-G2-GP 28
  MTCMR-H5 23
  MTCMR-H5-GP 24
power supply
  connecting 40
PTCRB 31

R

radio frequency interference 8
remove
  SIM card 39
RF specifications 31
RoHS 51
RS-232 36
  connector 12

S

safety
  modem 8
  RF interference 8
  vehicle 9
serial cable 36 40
set APN 45
signal strength
  verify 43
SIM card
  install 38
  remove 39
specifications 31
  C1 18
  E1 20
  EV2 15
  EV3 ....14 19
  G2 17
  H5 13
speed 45

T

temperatures
  C1 18
  E1 20
  EV2 15
  EV3 ....14 19
  G2 17
  H5 13

U

UL 34
USB
  connector 12

USB cable 40
user responsibility 10

V

vehicle power 34 40
vehicle safety 9
verify
    device setup 42